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may have been the cultures due to incomplete germination. One can not feel confident that the results were more than glimpses of the genetical possibilities and under these conditions speculation loses its point. We are not likely to be in a position to discuss satisfactorily the problems of *Oenothera* genetics until new series of experiments are undertaken with methods whereby the germination of seeds is forced to a finish.

Gates makes an attack on the extreme views of certain Mendelian writers who have held so strongly to a principle of the conservation or fixity of factors that they do not allow of their modification even through crossing. It may be doubted whether this group of Mendelians is really a large one, but so far as they do exist the criticisms of Gates are likely to have the sympathy of his readers. It is, however, one thing to recognize the complexity and possible instability of protoplasm as to its stereochemistry and quite another to hold that stereochemical changes within a pure species can produce such great modifications of morphological structure as the mutationists would have us believe. And the *oenotheras* are so strongly under suspicion of genetic complexity through hybridism that we have a right to expect that evidence for mutation from this group will be most critically sifted and only employed where it is found in material of proven purity.

One may be Mendelian, firmly believing in the principle of segregation following an  $F_1$  generation which is the principal tenet of Mendelism, and still admit the probability of modifications from time to time of the stereochemistry of germ plasm even in so-called "pure lines." That such changes may result in spontaneous modifications of structure seems reasonable on philosophical grounds and such modifications would constitute mutations since they are discontinuous. But it remains to be proven that such modifications affect changes in morphology to the degree claimed by the mutationists, although it may well be possible that numerous small mutations would in time have a cumulative effect readily recognized. Thus advances in evolution may come about

through numerous small steps, as held by Darwin, and some of these may be mutations, but it seems probable, as so strongly argued by Weismann, Lotsy and others, that the chief causes of variation in higher animals and plants and the most important directions of evolution are determined through the mixing of diverse germ plasmas with their complex interactions. Modifications of germ plasm through crossing, and mutations due to external chemical and physical factors, would be expected at times to work simultaneously, and in such cases it may become a difficult matter to distinguish their separate effects. Mutations even though small in degree would, however, if sufficiently numerous, work in time profound modifications of structure, and on this common ground the mutationists and the followers of Darwin seem to have the strongest hopes of reaching an agreement.

The final chapters, "A General Theory of Mutations" and "The Evolutionary Significance of Mutations," continue and elaborate the discussion which runs through the previous pages and thus largely summarize or expand the author's views. A bibliography of about 500 titles, of which 42 are by Gates, completes the work.

BRADLEY M. DAVIS

*A Text-book of Zoology for Universities, Colleges and Normal Schools.* By THOMAS WALTON GALLOWAY, Ph.D., Litt.D., Professor of Biology in the James Millikin University. Third edition, revised. P. Blakiston's Son & Company, Philadelphia.

It fell to the lot of the present writer to undertake a review of the first edition of this book<sup>1</sup> which was published in 1906. In paper, typography, binding, etc., the book is well made and attractive to look upon, a very deserved compliment to the publishers, who seldom allow anything inferior in the way of book-making to emanate from the house.

Intrinsically there is little change over the first edition, aside from the addition of some four chapters comprising about sixty-five pages more than the former book. The same plan

<sup>1</sup> SCIENCE, Vol. XXIV., p. 719.

of treatment which characterized the former has been continued. A slight change in the title, the former having been "A Text-book for Secondary Schools, Normal Schools and Colleges," may possibly reflect somewhat of the well-meant criticism of the reviewer, possibly some slight change of attitude on the part of the author, touching the attempt to comprise so large a scope of utility for a single book. The principal feature of the new edition calling for mention is that comprising the added chapters already referred to. These the author designates a "third part, a group of synthetic chapters (XXVI.-XXIX.) to induce the student to gather up the details of his course by a new reorganization of the materials." The captions of the chapters will indicate their scope. Chapter XXVI., "The Doctrines of Evolution and Related Ideas," among which are heredity and Mendelism. Chapter XXVII., a very interesting one, is devoted to "Economic Zoology," including such features as "Animals as a Food Supply, Animals as a Source of Clothing for Man, Animals in Science and Medicine," etc. Chapter XXVIII., "Development of Zoology," is a brief summary of the history of zoology, including the "Greek and Roman Periods, the Middle Ages, Modern Period and Its Specializations," and ending with sections of the "Philosophy of Biology, and Applications of Biology."

It is a matter of regret that some of the errors pointed out in the previous edition have been allowed to go uncorrected. For example, the obvious error in the description of expanded and contracted conditions of *Vorticella* in Fig. 70 (68 of the first edition). Perhaps the error was so obvious as to be regarded beyond the necessity of correction, assuming that every one concerned would make it for himself! Again, the pleasing bit of biological fiction involved in the symbiotic relations of certain hydroids and the hermit crab, that "the polyps cover up the shell occupied by the crab, thus concealing it from its enemies and its prey," the unwarranted assumption of which was shown in the former review, remains in spite of reviewer, or well-known facts to the contrary. In this connection may also be pointed

out that the illustrations of hydroid ontogeny shown in Fig. 84 are likewise of extremely doubtful validity, as are also other features in connection with the treatment of the coelenterates.

In conclusion the reviewer would incline to question the assumption of the author (Preface, p. v) "that the right text-book of zoology, as of every other subject, is primarily a matter of psychology." It would be futile to discuss this proposition in this connection, but it seems fairly evident that there may be intrinsic and inherent principles which determine, quite as much as any psychological quirks, the method and content of a zoological text-book.

C. W. H.

#### PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

THE tenth number of Volume 1 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *The Octopus Motive in Ancient Chiriquian Art*: GEORGE GRANT MACCURDY, Peabody Museum, Yale University.

After discussing general features of animal motives in Chiriquian art, the octopus motive, which appears hitherto not to have been identified, is traced through a number of varying forms in vases, of which six are figured in cuts.

2. *The Life Cycle of Trypanosoma brucei in the Rat and in Rat Plasma*: RH. ERDMANN, Osborn Zoological Laboratory, Yale University.

The method employed affords the means of following, outside the body of the host, the sequence of changes in the life of trypanosomes, and its use has shown dimorphic forms, latent or round, and crithidia-like forms in *Trypanosoma brucei* outside of the host.

3. *The Effect of Pressure on Polymorphic Transitions*: P. W. BRIDGMAN, Jefferson Physical Laboratory, Harvard University.

This note presents, in a compact form by means of diagrams, many of the essential facts concerning the effect of high hydrostatic pres-